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THE FRESH-WATER AQUARIUM.

BY C. B. BRIGHAM.

(Continued from page 377.)

It is useless, even were it possible, to give the exact amount of plants that are necessary to keep an aquarium in order. A very few pieces will be sufficient to purify the water, but as some water-plants are very beautiful, it may be desirable to have the maximum rather than the minimum amount of them in the aquarium. The fishes should have space enough to move around freely, and at the same time to be seen to advantage. Bearing this in mind my own taste would be to have as many plants as the tank would allow. As the water in the tank is changed from time to time the plants can be thinned out and the decaying stalks cut off.

The live stock of the aquarium is generally selected from fishes, lizards, snails, and mussels. One word as to the propriety of having many kinds of fish together in one tank. Some fish, such as sticklebacks or pickerel, are so voracious that either the other fish are wholly eaten up by them, or else their fins or tails are so maimed that they become objects of pity instead of amusement. Again, in selecting a stock of fish we should try to have them of a size proportioned to the tank they are to be put in. It is a great mistake to have in the tank a fish so large that it can hardly turn about; as a general rule, in our common sized tanks, the smaller the fish the better. At the same time we thus have a chance of having more specimens without diminishing too much the supply of oxygen. It is often very difficult to get small specimens of some kinds of fish, such as perch or eels. At certain seasons in the year it is the custom, in some places in the country, to draw off the water in the mill-pond and make repairs; if such a chance presents then is

the time for the lover of the aquarium to enjoy himself, for as the water is left in small, shallow holes, here and there, we shall find in these places multitudes of specimens only waiting to be preserved,—small perch in great numbers and many rare larvæ among the plants. At such a time too, we can make a choice of mussels, selecting for their beauty those whose shells are rayed with the darker shades of green. Very young bream are easy to catch in the net. Not so with those an inch or more long, and now is the chance offered to get as many as we wish. Perch and bream both need a good deal of care to make them live the year round in the tank, but they will repay a little trouble, as they become so tame if properly cared for. Speaking of the tameness of fishes it seems to be more a question of food than anything else; if fishes are fed at certain times, and are compelled to come to the top for the food they soon get into the way of coming up whenever one is near by, and will even jump out of the water at the bare finger. There is a little fish, found mostly in slowly running streams, called the roach; it is a very interesting fish for the aquarium on account of its peculiar shape and habits; it has two large side fins just behind the head, which it always keeps fully extended, looking as if it had an old-fashioned collar on. It remains motionless for the most of the time on the bottom of the stream, occasionally starting off, perhaps in search of food, only to sink down again to its former quiet position; it is easy to keep this fish in good condition in the aquarium. Young pickerel are desirable fish to have in the tanks if one can afford to keep only that kind of fish; placed with larger fish they do very well and constantly recommend themselves for their elegant movements, but with small fish, such as minnows, they live in constant war. In one of my tanks twenty-four minnows were killed within a week by a pickerel about an inch and a half long, and this while giving the pickerel a regular course of feeding on beef. Minnows have always held a high rank among the

fishes to be selected for the aquarium; collecting together in schools, tame, hardy and lively, they have qualities which few aquarial specimens possess. The stickleback (*Gasterosteus*) of which there are several varieties, is hardly a fish for the general collection; although of exquisite form, it is so fierce, especially in the breeding season, that it incessantly attacks the other fishes in the aquarium, and in a short time deprives them of more or less of their tails, making the unfortunate victims literally top-heavy, swimming with their tails, or rather what were once tails, much higher than their heads.

Sticklebacks should have a tank devoted exclusively to them and this especially if we wish them to build a nest, one of their peculiar accomplishments. Early in the spring the sticklebacks may be found in great numbers in the small ditches which drain the salt-water marshes. The male is easily distinguished from the female by its deep red color around the gills and its blue eyes, while the female has only the silvery scales. A pair taken at random usually live peaceably together; if it is in the right season they will soon look about for materials for a nest, taking bits of water-plants and even coming to the surface for small pieces of straw and sticks; with such materials they build a round nest about as large as a small English walnut, hollow in the centre and having two holes large enough to admit the fish on either side; the nest is built upon the branches of some of the water-plants. While the female is laying the eggs the male acts as guard, fiercely driving away anything coming within a certain radius of the nest. When the eggs are laid they resemble small globules of wet sago more than anything else. The female will be seen to fan these eggs quite often with her fins; this is probably to give them fresh water and to prevent any sediment from collecting upon them. After a fortnight or so, instead of eggs, we see in different parts of the tank what at first look most like very minute gold spangles as large as the head of a small

pin. On closer examination we find that they are the eyes of a very small fish. Their growth is so slow that in order to preserve them it will be well to remove them to a small tank by themselves, where they can be fed by placing a piece of raw beef on the end of a string, and hanging it over the edge of the tank into the water until it is turned white, when another piece can be introduced. The stickleback, as also the minnows, is easily accustomed to fresh water by freshening the salt-water gradually until it is quite fresh and then introducing the fish into the tank. The stickleback is not the only fresh water, nest building, fish. Wood mentions a curious fish found in tropical America, called by the natives the hassar; a fish which builds a nest as carefully as the stickleback, though one "not placed in the water but in a muddy hole just above the surface." Whether we have gold fish or not in the aquarium, is a matter of taste, some persons thinking that they give the aquarium a common fish-globe look. It seems to me if we can get some small ones of a brilliant color, and of good proportions, we should be glad to receive them into the tank. The great trouble with gold fish is that they are apt to be so deformed, some with the gaunt look of a starved fish, others with a hump on the back or a larger or smaller number of fins than usual. Gold fish would be worth keeping in the aquarium for their remarkable color alone if for nothing more.

Small eels and horned pouts add to the variety of fishes in the aquarium, but both are so uneasy and so very voracious that they are not pleasing inmates of the tank; wandering up and down the sides of the tank, they seem discontented and ill at ease. Young alewives are so beautiful that one is tempted to try them in the aquarium; rarely do they flourish in it.

One of the most interesting animals for the aquarium is the triton, or water-newt; these tritons are often found in what are called, in the country, pond holes, seldom in brooks or ponds; they are perfectly harmless and will remain on the

warm hand as long as one has patience to hold them; they come up to the surface to breathe, and therefore do not consume much oxygen; they are perfectly hardy and easy to keep alive, eating small pieces of beef eagerly; they occasionally change their skins, bringing the old skin over their heads and then swallowing them just as toads do. Their odd motions in the water, often poising themselves on the end of the tail or on one toe, are very amusing. They lay their eggs in the early spring either on or between the leaves of water-plants. By the middle of August the young are nearly two inches long; they breathe at first with gills, but by September they come to the surface for air, as the older ones do. These tritons outlive all the other specimens in the tank, and they live so peaceably with their companions that they are invaluable as aquarial specimens.—*To be concluded.*

REVIEWS.

THE DEVELOPMENT OF INSECTS.—Naturalists are now paying increased attention to the embryology of the articulates. After Rathke, Herold, and Kölliker had published their memorable works, there was an interval of twelve years between the publication, in 1842, of Kölliker's celebrated tract, entitled in Latin, "Observations on the first Genesis of Insects," and Zaddach's "Researches on the Development and Structure of Articulated Animals; Part I. The Development of Phryganidan Eggs," which appeared in 1854. Then followed Leuckart's "Propagation and Development of the Pupipara, from observations on *Melophagus ovinus*;" Huxley's article in the *Linnæan Transactions*, on the "Reproduction and Morphology of *Aphis*;" and Lubbock's essay on the "Ova and Pseudova of Insects," in the *London Philosophical Transactions* for 1859. Claparède, in 1862, published his splendid and beautifully illustrated prize essay on the "Evolution of Spiders," and a year after Weismann followed with a succession of brilliant works on the "Embryology and Anatomy of *Diptera*," which are in many respects the most important essays on the embryology of the hexapodous insects that have yet appeared, while the illustrations, very copious and detailed, are the most elaborate we have yet seen. Of great importance also is Mecznirow's "Researches on the